Species at Risk Act
Action Plan Series

Action Plan for the Barrens Willow (*Salix jejuna*) in Canada

Barrens Willow

2018

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Cover illustration: Barrens Willow © Peter Thomas, Environment and Climate Change Canada

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[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as Extirpated, Endangered, and Threatened for which recovery has been deemed feasible. They are also required to report on progress within five years after the publication of the final document on the SAR Public Registry.

Under SARA, one or more action plan(s) provides the detailed recovery planning that supports the strategic direction set out in the recovery strategy for the species. The plan outlines what needs to be done to achieve the population and distribution objective (referred to as the recovery goal and associated recovery objectives) identified in the recovery strategy, including the measures to be taken to address the threats and monitor the recovery of the species, as well as the proposed measures to protect critical habitat that has been identified for the species. The action plan also includes an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation. The action plan is considered one in a series of documents that are linked and should be taken into consideration together. Those being the COSEWIC status report, the recovery strategy, and one or more action plans.

The Minister of Environment and Climate Change is the competent minister under SARA for the Barrens Willow and has prepared this action plan to implement the recovery strategy, as per section 47 of SARA. To the extent possible, it has been prepared in cooperation with Fisheries and Oceans Canada and the Province of Newfoundland and Labrador, as per section 48(1) of SARA.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Environment and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this action plan for the benefit of the Barrens Willow and Canadian society as a whole.

Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical

[2] www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area[3] be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

[3] These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

Acknowledgments

Thanks to Julie Robinson for drafting the original version of this document. This action plan was prepared by Krista Baker ([formerly Environment and Climate Change Canada (ECCC), Canadian Wildlife Service (CWS) – Atlantic Region], Peter Thomas and Kathy St. Laurent (ECCC, CWS – Atlantic Region), in cooperation with members and associated specialists of the Limestone Barrens Species at Risk Recovery Team (LBSARRT). Thanks also to the LBSARRT for their knowledge and support during the preparation of this document. Thanks to the many graduate and undergraduate students whose research has contributed to our current knowledge of Barrens Willow.

Executive Summary

Barrens Willow (*Salix jejuna*) was listed as Endangered in 2003 under the *Species at Risk Act* (SARA). This action plan identifies recovery measures required to meet the population and distribution objective[4] outlined in the Amended Recovery Strategy for Barrens Willow (*Salix jejuna*) in Canada (Environment and Climate Change Canada 2018):

> To secure the long term persistence of the natural population throughout its range.

A total of 28 recovery measures are identified in this action plan and address 7 broad approaches (monitoring, habitat management and protection, restoration and species reintroduction, scientific research, *ex-situ* conservation, enforcement and compliance, and education and stewardship).

Critical habitat for the Barrens Willow was partially identified in the 2006 recovery strategy, and updated in the 2018 amended recovery strategy during the development of this action plan. The critical habitat section herein is exactly the same as the critical habitat presented in the 2018 amended recovery strategy (i.e., no further critical habitat is identified in this action plan). The critical habitat identified at this time for the species is still considered insufficient to meet the population and distribution objective. A schedule of studies has been developed to provide the information necessary to complete the identification of critical habitat. Additional critical habitat may be identified at a later date upon completion of the schedule of studies.

Critical habitat is identified on both federal and non-federal lands on the limestone barrens of the Great Northern Peninsula of Newfoundland. On federal land, Environment and Climate Change Canada (ECCC) is working with Fisheries and Oceans Canada to protect the species' critical habitat at Cape Norman. ECCC is collaborating with the Government of Newfoundland and Labrador to determine if the critical habitat on non-federal lands is considered protected.

A socio-economic evaluation for Barrens Willow was developed jointly with the Long's Braya (*Braya longii*) and Fernald's Braya (*Braya fernaldii*) socio-economic evaluations because their ranges, threats, and habitat are comparable. The direct and indirect costs associated with the implementation of this action plan are considered low. The implementation will not only benefit Barrens Willow, but the larger ecological community, including other species at risk (e.g., Fernald's Braya) found within the same habitat.

[4] Referred to as a recovery goal in the provincial recovery strategy (Part 1 of the Amended Recovery Strategy for the Barrens Willow (*Salix jejuna*) in Canada).

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1. Recovery Actions

1.1 Context and Scope of the Action Plan

Barrens Willow (*Salix jejuna*) is a low-lying deciduous shrub endemic to the limestone barrens on the north western part of the Great Northern Peninsula of insular Newfoundland. It was assessed as Endangered by COSEWIC in 2001 and subsequently listed as such under the *Species at Risk Act* (SARA) and the Newfoundland and Labrador *Endangered Species Act*. This action plan outlines the recovery measures required to meet the population and distribution objective[5] for Barrens Willow as outlined in the Amended Recovery Strategy for the Barrens Willow (*Salix jejuna*) in Canada (Environment and Climate Change Canada 2018).

The population and distribution objective for Barrens Willow is to secure the long-term persistence of the natural population throughout its range. The broad strategies (and associated approaches) to achieve this objective for Barrens Willow include the following:

1. Assess and monitor the status of the natural population (approach: monitoring)
2. Assess range and population dynamics of the natural population (approaches: habitat management and protection, and restoration and species reintroduction)
3. Define threats and limiting factors and mitigate controllable ones (approach: scientific research and *ex-situ* conservation)
4. Lessen to the extent possible additional habitat loss and degradation due to human activities (approach: enforcement and compliance)
5. Implement a stewardship program with local residents and targeted groups (approach: education and stewardship)

Barrens Willow has a very limited distribution and human activities associated with gravel extraction, road maintenance, and off-road vehicle use have degraded, and continue to degrade, its limestone barrens habitat. Recovery efforts for Barrens Willow focus on mitigating the threat of human disturbance by implementing permanent protection measures that support recovery of Barrens Willow and the unique limestone barrens ecosystem on which it and many other rare species (e.g., Fernald's Braya) occur.

This action plan should be considered along with the amended federal recovery strategy (Environment and Climate Change Canada 2018). The recovery strategy provides more details on the species, strategic direction, and approaches for recovery of Barrens Willow, including information on the approach to critical habitat identification and threats to the species.

[5] Referred to as a recovery goal in the provincial recovery strategy (Part 1 of the Amended Recovery Strategy for the Barrens Willow (*Salix jejuna*) in Canada).

1.2 Measures to be Taken and Implementation Schedule

Table 1. Implementation Schedule

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
Broad Strategy: Assess and monitor the status of the natural population				
	Approach: Monitoring			
1	Determine population size to help establish quantitative population and distribution objectives once an acceptable definition of an "individual" plant is established.	High	All threats	By 2019
2	Establish permanent monitoring plots and monitor population size, demographic parameters (e.g., longevity, productivity), and possible threats of pests and pathogens for all tagged plants and within permanent monitoring plots.	High	All threats	Every 5 years
3	Complete a census to identify population trends and spatial changes.	High	All threats	Every 5 years
4	Monitor and assess possible threat of climate change using the established climatic monitoring network (i.e., weather stations, air and ground temperature loggers, mechanical heave measuring instruments) to determine if climate changes are causing subsequent changes in plant population size, demographic parameters (e.g., productivity), etc.	Medium	Habitat loss & degradation; Climate change	Download logger data – annually; Collect other information – as required

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
Broad Strategy: Assess range and population dynamics of the natural population				
	Approach: Habitat management and protection			
5	Evaluate the current level of threat posed by land use activities on critical habitat at each known Barrens Willow location and on all areas where past management activities have been implemented. Assess the effectiveness of current management activities.	High	All threats	Every 5 years
6	Pursue the establishment of an ecological reserve adjacent to the federal property at Cape Norman.	High	Habitat loss and degradation	By 2019
7	Pursue the expansion of the Watts Point Ecological Reserve northward to include populations of Barrens Willow.	High	Habitat loss and degradation	By 2019
8	Appropriately mark (e.g., with signs, curbs) high-use areas of critical habitat to discourage off-road vehicle and pedestrian traffic.	High	Habitat loss and degradation	As required
9	Review and validate current archive of geo-referenced data, and update with new survey information.	Medium	Habitat loss and degradation	By 2019
10	Identify and consult with interest groups associated with critical habitat use (e.g., all-terrain vehicle users, snowmobile users). Provide groups with information on critical habitat conservation.	High	Habitat loss and degradation	By 2020
11	Develop and deliver "safe-use" educational materials that describe how work can be carried out in a way that minimizes disturbance to habitat (including maps that identify areas of critical habitat) to service providers and heavy equipment operators on the limestone barrens.	High	Habitat loss and degradation	Ongoing
12	Develop and implement an off-road vehicle mitigation plan to prevent loss of, and damage to critical habitat.	Medium	Habitat loss and degradation	Ongoing thru to 2020

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
	Approach: Restoration and species reintroduction			
13	Within critical habitat, evaluate damage to determine if restoration is necessary.	Medium	Habitat loss and degradation	By 2020
14	If restoration is deemed necessary, determine and implement appropriate methods for Barrens Willow reintroductions using cuttings. Success of rooted cuttings may be improved by rehabilitating compressed substrate.	Medium	Habitat loss and degradation	By 2022
Broad Strategy: Define threats and limiting factors and mitigate controllable ones				
	Approach: Scientific Research			
15	Use appropriate tools to improve species definition and then determine the genetic variation within and among populations, assess whether hybridization is occurring, and determine the extent of clonal growth within all populations.	High	Changes in ecological dynamics	By 2020
	Approach: *Ex-situ* conservation			
16	Maintain *ex-situ* collection at Memorial University of Newfoundland Botanical Garden and monitor plants for survival and the presence of pathogens and insect pests.	High	All threats	Annually
17	Improve the current *ex-situ* collection by establishing more cuttings to include plants of both sexes and at least ten individuals from each established population. Once the natural genetic diversity of wild populations is known, modify population representation as appropriate.	High	All threats	Ongoing

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
Broad Strategy: Lessen to the extent possible additional habitat loss and degradation due to human activities				
	Approach: Enforcement and compliance			
18	Train and provide opportunity to update wildlife and enforcement officials about regulations and issues related to species at risk and critical habitat.	Medium	Habitat loss and degradation	As required
19	Agencies or institutions carrying out recovery activities to communicate with, and extend invitation to, Federal Wildlife Officers and Provincial Conservation Officers about planned activities in, or adjacent to, critical habitat.	Medium	Habitat loss and degradation	As required
20	Encourage intergovernmental communication between all federal, provincial, and municipal agencies that have land-use management, or permitting responsibilities for populations of Barrens Willow and associated critical habitat.	Medium	Habitat loss and degradation	Ongoing
Broad Strategy: Implement a stewardship program with local residents and target groups				
	Approach: Education and stewardship			
21	Based on field observation of the occurrence of activities that threaten Barrens Willow, identify areas with stewardship needs and initiate stewardship activities where required.	High	Habitat loss and degradation	Ongoing
22	Ensure local participation in delivery of recovery activities, such as the establishment of new protected areas or restoration projects.	Medium	All threats	Ongoing
23	Continue to pursue, update, and evaluate stewardship agreements between the Limestone Barrens Habitat Stewardship Program (LBHSP) and local communities, schools, and organizations.	Medium	Habitat loss and degradation	As required

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
24	Provide information on limestone barrens species at risk and critical habitat conservation to technical and non-technical audiences through use of effective media and social outlets.	Medium	All threats	Ongoing
25	Regularly update the limestone barrens website (www.limestonebarrens.ca) to ensure information is current.	Medium	All threats	As required
26	Engage and support the Limestone Barrens Community Working Group by encouraging members to attend regular meetings of the Limestone Barrens Species-at-Risk Recovery Team.	Medium	All threats	Annually
27	Conduct surveys to determine changes in public attitude and knowledge and evaluate effectiveness of existing stewardship and education measures (e.g., develop and implement a method to assess the effectiveness of the limestone barrens curriculum in the classroom).	Medium	Habitat loss and degradation	As required
28	Erect interpretive panels that display information on species biology, population status, and critical habitat conservation at key Barrens Willow sites (i.e., where signs would have the most impact on Barrens Willow conservation without compromising persistence).	Medium	Habitat loss and degradation	By 2019

[a] "Priority" reflects the degree to which the measure contributes directly to the recovery of the species or is an essential precursor to a measure that contributes to the recovery of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the population and distribution objectives for the species. Medium priority measures may have a less immediate or less direct influence on reaching the population and distribution objectives, but are still important for the recovery of the population. Low priority recovery measures will likely have an indirect or gradual influence on reaching the population and distribution objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

1.3 Critical Habitat

Critical habitat is the habitat that is necessary for the survival or recovery of the species. Section 41(1)(c) of SARA requires that the recovery strategy include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. Critical habitat was updated in the amended Barrens Willow recovery strategy during the development of this action plan due partly to the recent (ca. 2014) discovery of new occurrences of the species (Environment and Climate Change Canada 2018). The critical habitat section of this action plan is therefore exactly the same as the critical habitat presented in the 2018 amended recovery strategy.

Critical habitat for the Barrens Willow is partially identified, to the extent possible, based on the geographic location and biophysical attributes. It is recognized that the critical habitat identified at this time for the species is insufficient to meet the population and distribution objective. A schedule of studies has been developed to provide the information necessary to complete the identification of critical habitat (see next section: Schedule of Studies).

1.3.1 Identification of the species' critical habitat

Critical habitat for the Barrens Willow is identified within the defined geographic location (1.3.1.1) as all areas of naturally-occurring limestone barrens habitat where the biophysical attributes (1.3.1.2) are found, and that are occupied by the species. In general, these areas are exposed coastal limestone barren habitat where vegetation cover is sparse due to regular disturbance by wind and frost. These areas experience dry to periodically wet conditions related to the amount of rain and snowfall. The substrate[6] is generally silt and/or sand accumulated in depressions and openings between rocks, or open silt, sand and gravel, sometimes sorted by frost[7].

Areas containing critical habitat were delineated using a central point within naturally-occurring limestone barrens habitat known to be occupied by the species and using the distance from that point to the furthest edge to inscribe a circle that encompassed the entire habitat; as the habitat areas were different shapes and sizes, the distance from the central point to the furthest edge necessarily varied. Parts of the circle that clearly did not contain the biophysical attributes of critical habitat (e.g. water bodies, forest and other land cover types that appear as mapped layers within our GIS database) were removed.

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[6] The surface or material on or from which an organism lives, grows, or obtains its nourishment.

[7] Frost sorting is a geologic process whereby differential frost heaving sorts unconsolidated material (i.e., reorganization of surface material into similar sizes) and is a key mechanism in the formation of some types of patterned ground surfaces such as sorted stripes and sorted circles.

1.3.1.1 Geographic Location

Critical habitat for the Barrens Willow is located within the Strait of Belle Isle ecoregion along the north coastal section of the Great Northern Peninsula of Newfoundland between Eddies Cove (51° 25′ N and 56° 26′ W) and Cook's Harbour (51° 36′ N and 55° 53′ W). See Figures 1 to 7 for more detail on the location of critical habitat.

1.3.1.2 Biophysical Attributes

Within the areas identified as containing critical habitat for the Barrens Willow, critical habitat exists where naturally-occurring limestone barrens habitat with the following biophysical attributes occurs:

- substrate is a mixture of exposed calcareous bedrock outcrops[8], thin layers of frost-shattered[9] calcareous gravel and shallow calcareous soils; and
- substrate characterized by angular boulders, rocks, and pebbles, often in a fine-grained sediment matrix; and
- vegetation height less than 10 cm; and
- vegetation cover rarely exceeding 50%; and
- in some cases, substrate may be sorted by frost action (i.e., a circular or striped pattern may be present - see footnote 7).

Barrens Willow can sometimes establish in limestone barrens habitat altered by human activities (e.g., areas cleared to build road surfaces and to support power and telephone pole construction). However, despite such capability, abiotic[10] limitations including substrate moisture, particle composition and thermal regime prevent long-term viable establishment for some rare species (Janes 1999). Habitat altered by human activity contains homogenous gravel substrates that do not exhibit patterning or sorting, are missing a distinct fine-grained component, and have low plant species diversity (Greene 2002; Rafuse 2005; Robinson 2010). These areas altered by human activities are therefore not considered critical habitat. Restored limestone barrens habitat occupied by the species will be considered for critical habitat identification if the biophysical attributes listed above are present.

[8] The part of a rock formation that appears above the surface of the ground.
[9] Frost-shattering is a process that occurs in cold climates whereby water enters cracks in exposed rocks, subsequently freezes and the pressure created by the ice causes the rock to break apart.
[10] Physical rather than biological; not derived from living organisms. Abiotic factors in an environment include such items as sunlight, temperature, wind patterns, and precipitation.

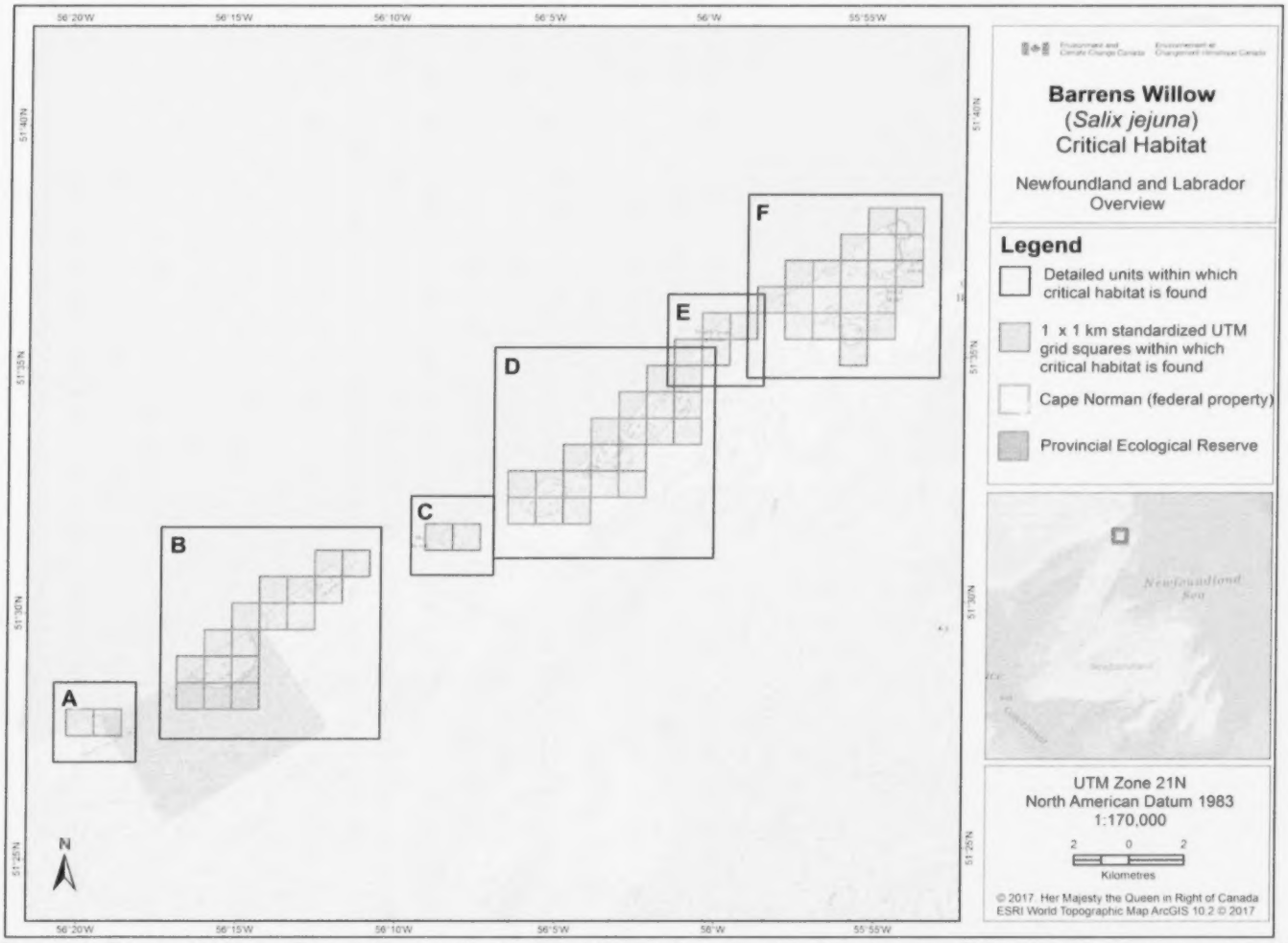

Figure 1. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

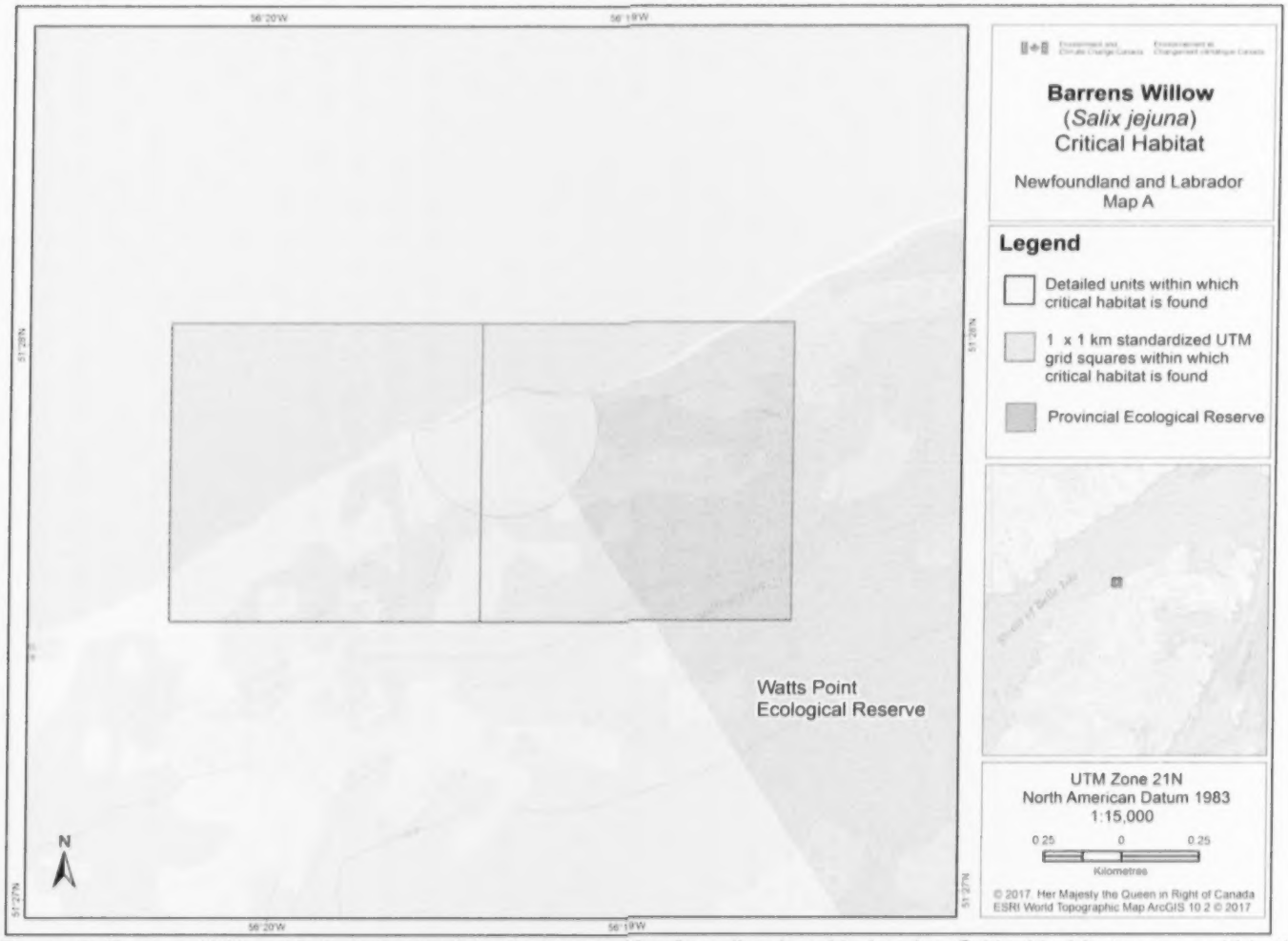

Figure 2. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

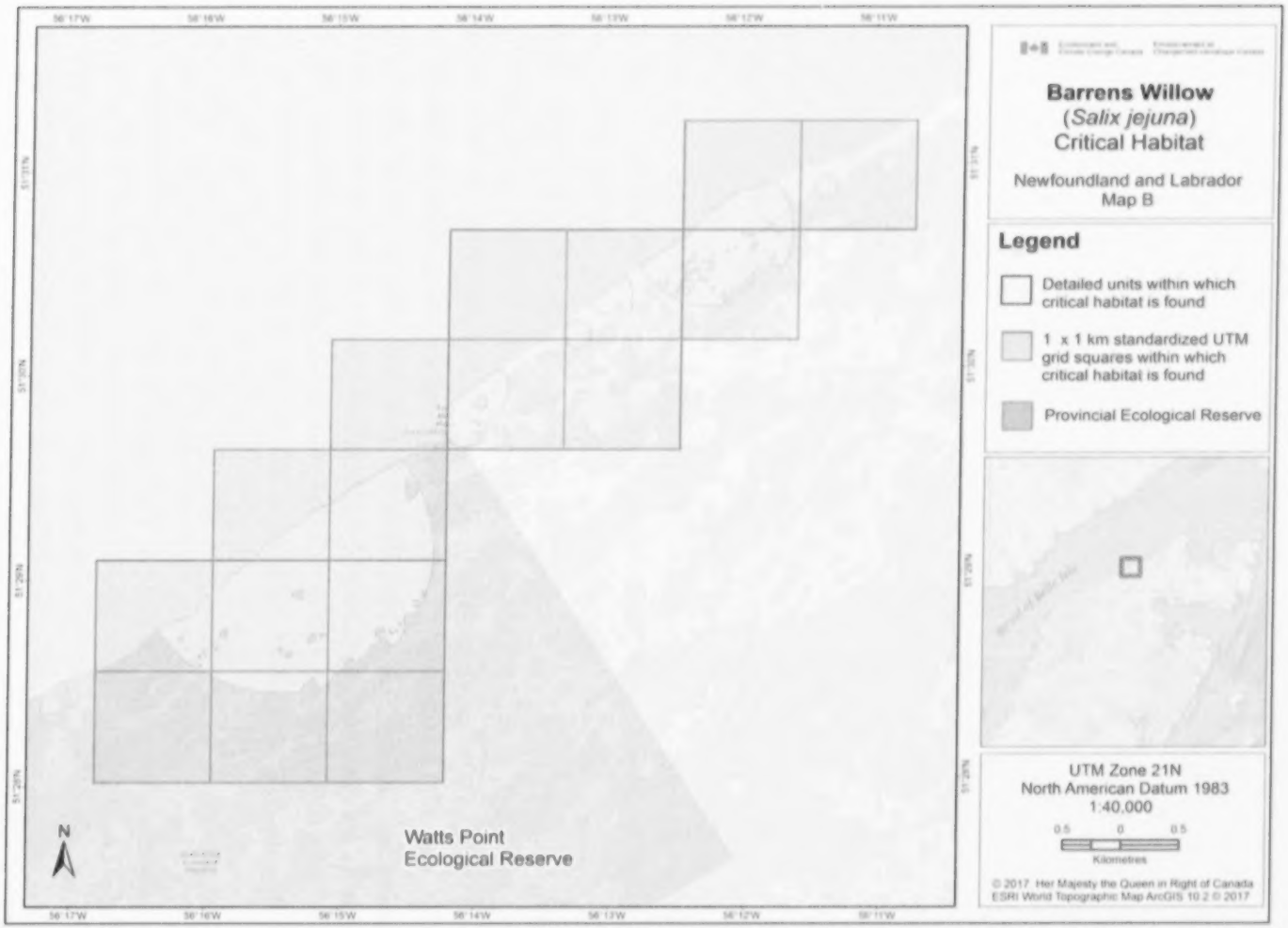

Figure 3. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

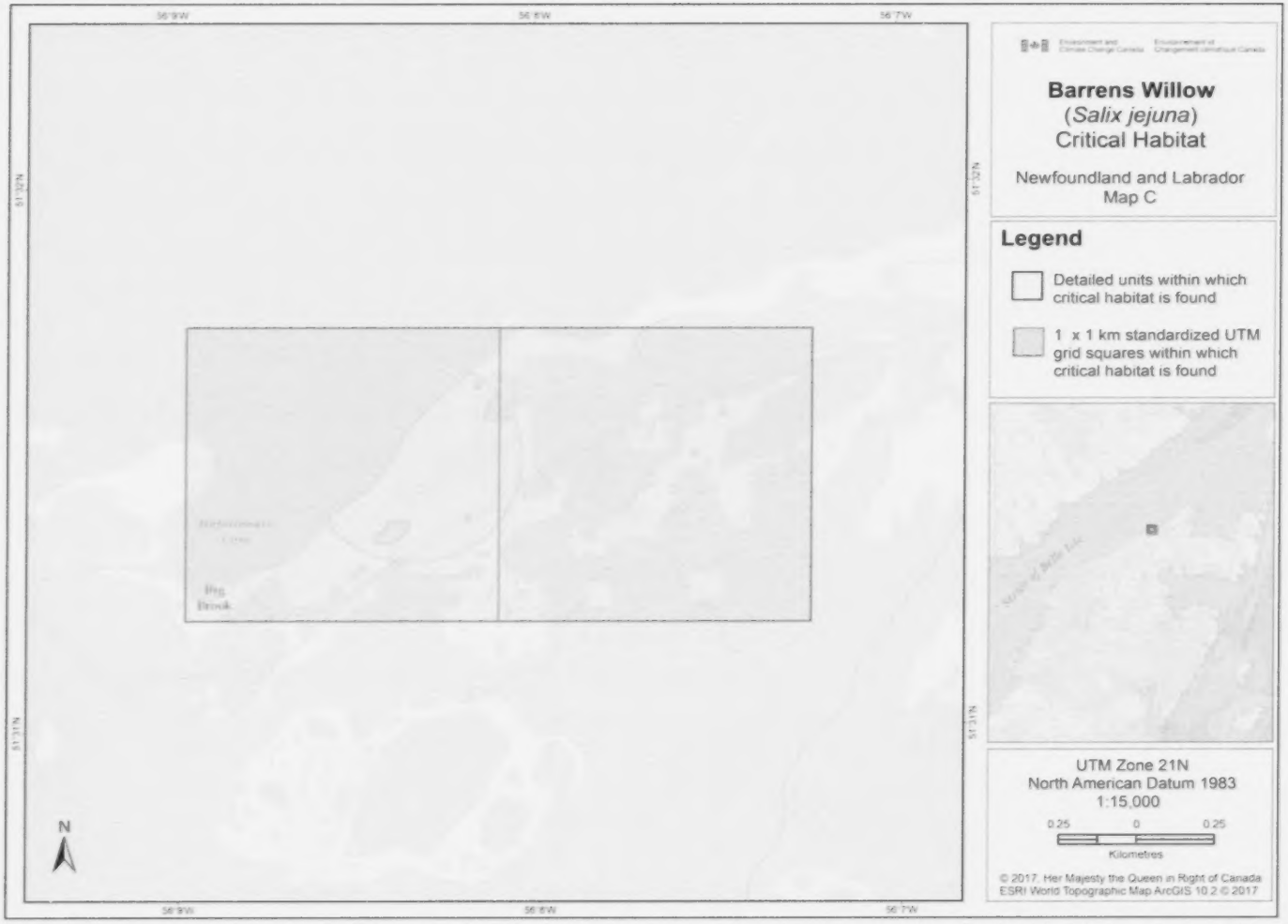

Figure 4. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

Barrens Willow
(Salix jejuna)
Critical Habitat
Newfoundland and Labrador
Map D
Legend
Detailed units within which critical habitat is found
1 x 1 km standardized UTM grid squares within which critical habitat is found
UTM Zone 21N
North American Datum 1983
1:40,000
0.5 0 0.5
Kilometres
© 2017, Her Majesty the Queen in Right of Canada
ESRI World Topographic Map ArcGIS 10.2 © 2017
N

Figure 5. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

Figure 6. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

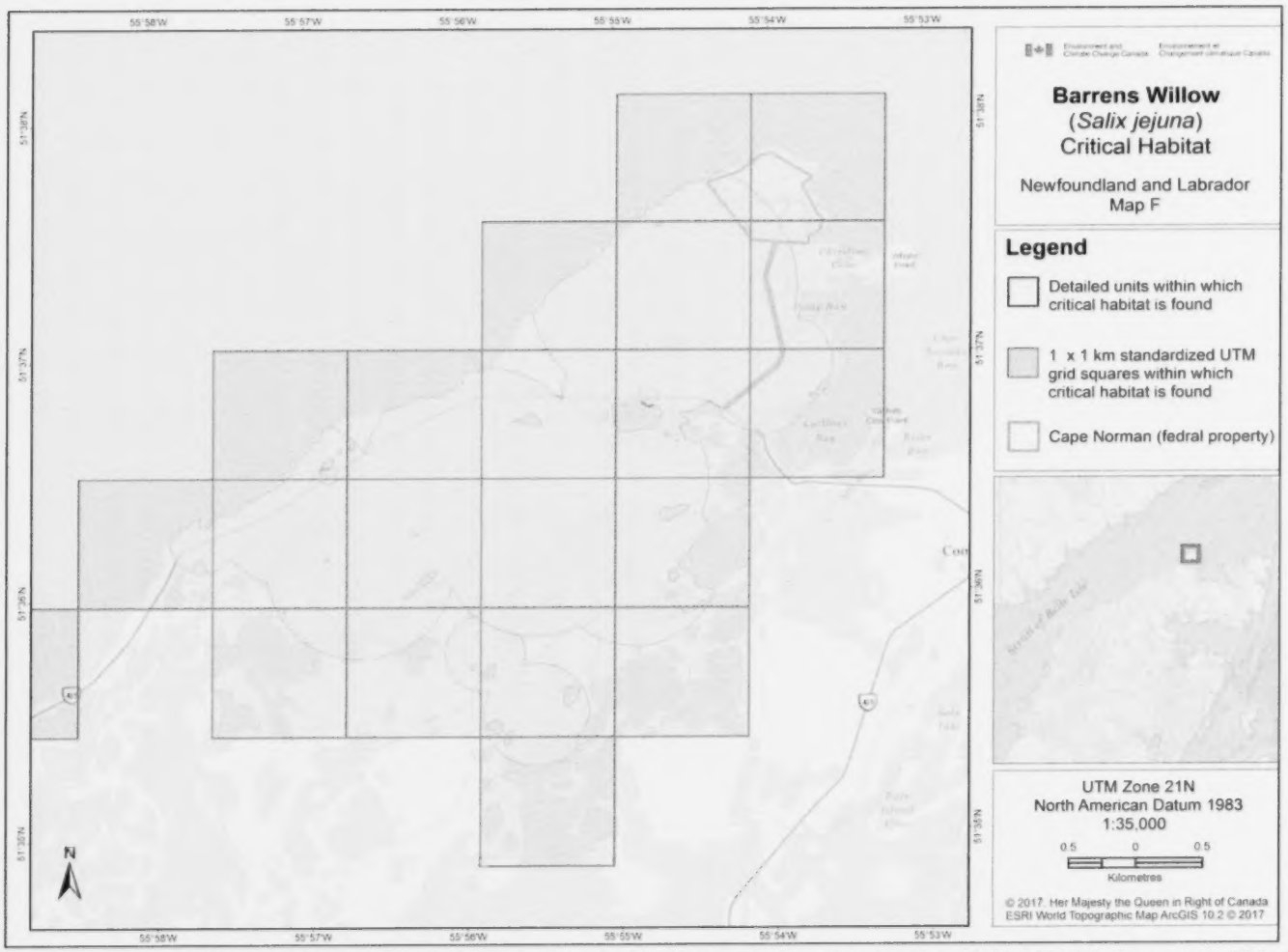

Figure 7. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

1.3.2 Schedule of studies

The provincial recovery strategy developed by Newfoundland and Labrador outlines the research to be done on the species' ecology and conservation. The following schedule of studies (Table 2) outlines the activities required to complete the identification of critical habitat for the Barrens Willow.

Table 2. Schedule of Studies to Identify Critical Habitat

Description of Activity	Rationale	Timeline
Finalize surveys of potential habitat	The completion of surveys to locate natural areas of occurrence within priority areas is needed to fully identify critical habitat.	2014-2020
Study population dynamics in order to establish a quantitative population and distribution objective	Quantifying the population and distribution objective will allow for a more thorough assessment of the amount of critical habitat needed to meet the objective.	On-going
Determine biophysical factors explaining presence of the species and habitat quality, including factors related to colonization or introduction	Understanding factors related to species 'presence and persistence will ensure the description of biophysical attributes is complete.	On-going

1.3.3 Activities likely to result in destruction of critical habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it no longer meets the needs of the species. Destruction may result from one or more activities at one point in time, or from the cumulative effects of one or more activities over time. Examples of activities likely to result in the destruction of critical habitat are outlined below, but are not limited to the following list:

1) The removal of substrate, vegetation and/or the organic layer, or the deposition of material that prevents Barrens Willow from germinating, establishing, growing and/or reproducing. Specific examples include commercial or industrial activities, such as limestone gravel excavation, quarrying, drilling, and road construction, including the deposition of associated materials and by-products from of these activities (e.g., gravel and stone piles). Other local activities include the development of recreational trails for eco-tourism purposes.

2) Substrate compaction and substrate damage (e.g., limestone shattering) that affects normal root function, seedling recruitment, and natural hydrologic patterns. Specific examples of activities capable of causing compaction and substrate damage

include the use of vehicles (e.g., all-terrain vehicle, dirt bike, heavy equipment, car, etc.) off of designated trails and roadways, for example, to conduct maintenance of roads (off of the existing road bed), utility corridors, and service lines; use of off-road vehicles in areas other than on designated roadways/trails; and the placement of temporary or permanent structures. It is important to note that even a single pass of a vehicle (e.g., all-terrain vehicle, dirt bike, heavy equipment or car), especially when the substrate is wet, can cause enough compaction to result in the loss of habitat function.

3) Any activity that reduces the quality of habitat by removing, adding or covering substrate or otherwise damaging components of the plant community. Specific examples include the laying out of fish nets or other fishing equipment, the collecting of rock or plants for horticultural purposes, picnicking in places other than those marked for that purpose, the depositing of waste material, and the introduction of plants or animals non-native to the limestone barrens.

All of these activities can have severe impacts on habitat that is critical to the persistence of the species and can result in direct plant mortality and population decline.

1.4 Proposed Measures to Protect Critical Habitat

Critical habitat for Barrens Willow is located on both federal and non-federal lands on the northwestern part of the Great Northern Peninsula of insular Newfoundland (Figures 1 to 7).

1.4.1 Measures proposed to protect critical habitat on federal lands

The federal property at Cape Norman (a property of approximately 45 hectares, owned and operated by Fisheries and Oceans Canada) is identified as critical habitat for Barrens Willow. Section 58(5) of SARA requires the competent minister to make an order for any part of the critical habitat that is not legally protected by the provisions or measures under SARA or any other federal act within 180 days of the final posting of the recovery strategy identifying the critical habitat in the Species at Risk Public Registry. If the competent minister does not make the order, he or she must include in the Public Registry a statement setting out how the critical habitat or portions of it are legally protected. ECCC is currently working with Fisheries and Oceans Canada to develop an order to protect critical habitat on federal land at Cape Norman under sections 58(4) and (5) of SARA.

1.4.2 Measures proposed to protect critical habitat on non-federal lands

With regard to the portions of critical habitat found on non-federal lands, ECCC will assess the protection currently in place. This involves first working with the Government of Newfoundland and Labrador to determine which laws and legal instruments are in place to prevent destruction of critical habitat. If there are gaps in the protection of critical habitat, provisions or measures in place under SARA or other federal legislation

will be reviewed to determine whether they prevent destruction of critical habitat. The laws and legal agreements in place that protect critical habitat will be monitored for efficacy at least every five years. Conservation measures, including stewardship initiatives, that contribute to preventing critical habitat destruction will also be considered and monitored.

If it is determined that any portions of critical habitat are not protected, and steps are being taken to protect those portions, those steps will be communicated via the Species at Risk Public Registry through the reports referred to in section 63 of SARA.

2. Evaluation of Socio-Economic Costs and of Benefits

The *Species At Risk Act* requires that an action plan include an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation (SARA 49(1)(e), 2002). This evaluation addresses only the incremental socio-economic costs of implementing this action plan from a national perspective as well as the social and environmental benefits that would occur if the action plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species recovery in general nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision making on implementation of the action plan by partners.

The protection and recovery of species at risk can result in both benefits and costs. The Act recognizes that "*wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons*" (SARA 2002). Self-sustaining and healthy ecosystems with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians. A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value the public places on such actions (Loomis and White 1996, DFO 2008). Furthermore, the conservation of species at risk is an important component of the Government of Canada's commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada has also made a commitment to protect and recover species at risk through the Accord for the Protection of Species at Risk. The specific costs and benefits associated with this action plan are described below.

The Barrens Willow socio-economic assessment was conducted jointly with the Long's Braya and Fernald's Braya as their range and habitat are comparable. Limestone barrens conservation in Newfoundland is an important issue, and stewardship initiatives are underway from multiple organizations to facilitate and promote these efforts.

2.1 Policy Baseline

The province of Newfoundland and Labrador has access to many legislative, regulatory, and management tools for the conservation and stewardship of Barrens Willow (e.g., Newfoundland and Labrador's *Endangered Species Act*, Newfoundland and Labrador *Wilderness and Ecological Reserves Act*, and Sensitive Wildlife Area designations).

The Limestone Barrens Habitat Stewardship Program has been ongoing in the area for many years in an effort to promote the long term conservation of rare plants in the area.

Additionally, many recovery measures can be carried out by federal species at risk funding programs, contributions by recovery biologists, or research by universities.

2.2 Socio-economic Profile and Baseline

There are few communities that are affected by protection of the species and its critical habitat. The human population in the immediate area is approximately 300 people. The primary industries of the area relate to the fishery and natural resource extraction. Although there are no Indigenous groups native to the area, Qalipu First Nation has indicated traditional use of resources on the Great Northern Peninsula, but not within 100 km of Barrens Willow critical habitat (AMEC 2002).

2.3 Socio-economic Costs of Implementing this Action Plan

Direct costs are those that result from the implementation of the approaches identified in the implementation schedule (Table 1). Only the incremental costs are considered and therefore do not include ongoing actions or initiatives discussed in section 2.1 (Policy Baseline). Certain approaches listed in the implementation schedule also apply to the recovery of Fernald's Braya and Long's Braya because these species coexist at a number of sites identified as critical habitat. As a result, the action plan for the Barrens Willow and the action plan for the Long's Braya and the Fernald's Braya (Environment and Climate Change Canada 2016) were developed concurrently. In order to ensure that all direct costs are captured, the shared costs have been calculated in both action plans. The direct costs of implementing the recovery actions for all three species are expected to be low (between $0 and $5 million) over the short (2018-2023) and long term. These anticipated costs include salary, volunteer time, travel, materials, equipment, and other related costs.

Indirect costs are the costs associated with implementing the action plan, which may have an impact on various stakeholders. Impacts to stakeholders include foregoing or modifying current and future activities. The anticipated indirect costs of implementing this action plan are considered low.

Off-road vehicle (ORV)[11] damage is a threat throughout the limestone barrens. Presently, the Watts Point Ecological Reserve prohibits the use of ORVs (Parks and Natural Areas Division 1990), and it is expected that the proposed expansion area will have a comparable prohibition against motorized vehicles. In addition, critical habitat found on federal property in the Cape Norman area will be protected from destruction by ORV use through the measures under SARA. However, there is minimal foreseen impact to ORV users given the relatively small area that will be affected.

Quarry operators may need to spend additional time completing the provincial application process and searching for newly proposed quarry sites to ensure they are outside of critical habitat.

2.4 Benefits of Implementing this Action Plan

2.4.1 Value of biodiversity to Canadians

Biodiversity is essential for healthy ecosystems, human health, prosperity, security and well-being. Canadians derive many benefits from biodiversity including recreational, aesthetic, educational, cultural benefits as well as ecological goods and services essential to human survival. Care for the environment is consistently ranked as one of Canada's top priorities in public opinion polls[12]. A recent opinion poll found that three quarters of Canadian respondents feel that preserving natural areas and the variety of native plant and animal life in Canada is important to them[13].

The total value of endangered species consists of non-consumptive use values (such as recreation, spiritual/cultural, research, and education), indirect use values (value of the ecological role of a species in an ecosystem), and non-use values (i.e., preserving the benefits of nature for future generations)[14]. Achieving the goal of this action plan will have a positive impact on society. The direct value of recovering Barrens Willow, for the preservation or the enhancement of biodiversity, is not easily estimated.

2.4.2 Eco-tourism and cultural values

Eco-tourism is the fastest-growing area of the tourism industry (Mastny 2001). In 2004, this market grew three times faster than the industry as a whole and the World Tourism Organization estimates that global spending on eco-tourism is increasing by 20% a year, about six times the industry-wide rate of growth (TEEB 2008).

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[11] ORVs include ATVs, dirt bikes, dune buggies, four wheel drive vehicles (jeeps), etc.

[12] Canada's Fourth National Report to the United Nations Convention on Biological Diversity, 2010. Available online http://www.cbd.int/doc/world/ca/ca-nr-04-en.pdf Accessed December 3, 2010.

[13] Ipsos Reid Opinion Poll "Nine in Ten (87%) Canadians Say That When Connected to Nature They Feel Happier." Released January 7, 2011, www.ispsos.ca

[14] Non-use values include bequest value (satisfaction of knowing that future generations will have access to nature's benefits), altruist value (satisfaction of knowing that other people have access to nature's benefits) and existence value (satisfaction of knowing that a species or ecosystem exists).

The communities near critical habitat have been attempting to utilize the uniqueness of the local terrain as a way to generate economic growth. Northern Newfoundland is made up of small coastal communities with a recent history of unemployment and loss of industry. The expansion of Watt's Point Ecological Reserve, the potential designation of an area near Cape Norman as an ecological reserve, and protecting the limestone barrens' rare plant species may enhance tourism in the local communities.

As a result of achieving the recovery goals of this action plan, there may be an increase in eco-tourism activity, and the associated economic spin offs to local businesses and enhanced cultural value of local communities.

2.4.3 Conservation of other species

Of the approximately 300 rare vascular plants on the island of Newfoundland, approximately 33% reside in the ecoregions containing limestone barrens, with 30 species being endemic to, or found only on, the limestone barrens. Barrens Willow, Long's Braya, and Fernald's Braya are all endemic to the limestone barrens. By focusing on permanent conservation measures, including the expansion of ecological reserves and increased communication among provincial agencies, as well as improved public outreach, it is expected that the recovery approaches outlined in the action plan will benefit the larger ecological community as well as other species at risk.

2.5 Distributional Impacts

Although Barrens Willow occurs on provincial, federal, and private properties, private landowners are not expected to bear the brunt of the responsibility for the species' recovery. Non-governmental organizations are active in Newfoundland and Labrador where the species occurs, and an approach of this action plan is to foster cooperative relationships with landowners and others to maintain critical habitat.

3. Measuring Progress

The performance indicators presented in the associated recovery strategy provide a way to define and measure progress toward achieving the population and distribution objective (referred to as a recovery goal in the provincial recovery strategy).

Reporting on implementation of the action plan (under s. 55 of SARA) will be done by assessing progress towards implementing the broad strategies.

Reporting on the ecological and socio-economic impacts of the action plan (under s. 55 of SARA) will be done by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the action plan.

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Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with *the* Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals[15]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[16] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of action plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the action plan itself, but are also summarized below in this statement.

Overall, the recovery of Barrens Willow will be beneficial to society as a whole within the species' range in Newfoundland and Labrador, but the specific type and extent of benefit is difficult to assess and quantify. Much of the thinking surrounding the recovery and socio-economic impact of Barrens Willow was considered in conjunction with the recovery of other limestone barrens species – primarily Long's Braya and Fernald's Braya that are also SARA-listed species. Recovering these species at risk within the context of all the limestone barrens habitat allows for more comprehensive recovery of habitat, while also demonstrating a landscape recovery approach to the public. Section 2 of this action plan will more completely discuss the merits of a landscape/multi-species approach to recovery.

[15] www.ceaa.gc.ca?default.asp?lang=En&n=B3186435-1
[16] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1